James Albert Ward, Reg. No. 34,041
Space and Naval Warfare Systems Center D0012
53510 Silvergate Avenue
San Diego, CA 92152-5765
(619)553-3001

PATENTS
Navy Case No. 77,222

#16
Rose
1-7-02

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231

on 10 December 2001
Date

by Linda B. Brady
Depositor

Linda B. Brady
Signature

BEFORE THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF APPEALS AND INTERFERENCES

Serial No: **08/908,778** Examiner: **Gims S. Philippe**

Filing date: **August 7, 1997**

Appellant: **Richard Scheps** Art Unit: **2713**

Title: **HIGH RESOLUTION IMAGING LIDAR FOR DETECTING SUBMERGED OBJECTS**

Commissioner for Patents
Washington, DC 20231

Dear Sir:

APPELLANT'S BRIEF PER 37 C.F.R. §1.192

This is an appeal from the Examiner of Group Art Unit 2713 rejecting claims 1-7, which are set forth in an APPENDIX hereto, and which together comprise all remaining claims in the application. Appellants mailed Notice of Appeal on October 10, 2001. Two additional copies of this Appellant's Brief are tendered herewith.

REAL PARTY IN INTEREST

As shown in the Assignment filed with the USPTO (at Reel 8657, Frames 0058-9) on August

07, 1997, the above-captioned inventor assigned his entire interest in this application to:

United States of America as represented by the Secretary of the Navy

who are the real party in interest.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1-6 were submitted with the original application on August 07, 1997 and were rejected by the Examiner in the Office Action mailed on December 28, 1999. After Appellant's Response filed on February 09, 2000 requesting reconsideration and withdrawal of the rejections of claims 1-6, the Examiner again rejected claims 1-6 on different grounds in the non-final Office Action mailed on April 24, 2000. In an Amendment and Response filed on July 19, 2000, Appellant amended claims 1 and 4-5 and added new claim 7, requesting reexamination of all claims. The Examiner then rejected claims 1-7 on different grounds in the Final Office Action mailed on October 04, 2000.

On January 04, 2001, Appellant filed a Request for Continued Examination and a Response requesting reconsideration of the particular grounds and withdrawal of the rejections of claims 1-7. In the Office Action mailed on March 06, 2001, the Examiner again rejected claims 1-7, but on different grounds, returning substantially to the grounds asserted in the initial December 29, 1999 Office Action before any claim amendment. On June 06, 2001, Appellant filed a Response requesting reconsideration of these particular grounds for these particular claims. Finally, the Examiner, reasserted the same grounds, affirmed rejection of claims 1-7 in the Final Office Action mailed on August 10, 2001, wherein:

Claims 1, 3, 5 and 7 are rejected under 35 U.S.C. §102(b) for anticipation by U.S. Patent 5,457,639 issued on October 10, 1995 to Ulich *et al.* (Ulich '639);

Claim 2 is rejected under 35 U.S.C. §103(a) for obviousness over Ulich '639 in view of U.S. Patent 5,822,047 issued on October 13, 1998 to Contarino *et al.* (Contarino '047);

Claim 4 is rejected under 35 U.S.C. §103(a) for obviousness over Ulich '639 in view of U.S.

Patent 5,082,362 issued on January 21, 1992 to Schneiter (Schneiter '362); and

Claim 6 is rejected under 35 U.S.C. §103(a) for obviousness over Ulich '639 in view of U.S. Patent 5,117,126 issued on May 26, 1992 to Geiger (Geiger '126).

These rejections of claims 1-7 are appealed.

STATUS OF AMENDMENTS AFTER FINAL REJECTION

No relevant Amendments After Final Rejection are presented.

SUMMARY OF THE INVENTION

The invention includes an imaging lidar having a laser for generating a line scan of light beam pulses to illuminate an area surrounding a target. The scanning beam may be pulsed at a rate sufficient for high data acquisition rates used in high-resolution imaging applications and at a high energy efficiency suitable for airborne platforms. An image acquisition controller selects pulse width and pulse rate of the light beam pulses emitted by the laser. A photomultiplier tube detects energy from the light beam pulses scattered by the target and generates an output signal representing a series of pixels corresponding to the light beam pulses. The signal-to-noise ratio is enhanced by gating the received pulse to exclude most of the ambient sunlight and surface scattered light reaching the scanning beam detector. A display generates an image from the output signal that is representative of the target. The photomultiplier tube output signal may be gated to block light scattered from ranges other than a selected range window for the target, such as from a water surface. The range of objects in the scanned image may be determined with high resolution for contour mapping applications.

ISSUES PRESENTED FOR REVIEW

Whether the teachings of Ulich '639 anticipate all elements of claims 1, 3, 5 and 7 as amended.

Whether the Examiner has presented a valid *prima facie* case for the obviousness of any of claims 2, 4 and 6 in the Final Office Action mailed on August 10, 2001.

Whether the teachings of Ulich '639 in view of Contarino '047 suggest that claim 2 would

have been obvious to a skilled practitioner on August 07, 1997.

Whether the teachings of Ulich '639 in view of Schneiter '362 suggest that claim 4 would have been obvious to a skilled practitioner on August 07, 1997.

Whether the teachings of Ulich '639 in view of Geiger '126 suggest that claim 6 would have been obvious to a skilled practitioner on August 07, 1997.

GROUPING OF CLAIMS

The rejected claims 1-7 form a single group drawn to an imaging lidar.

ARGUMENT

The teachings of Ulich '639 do not anticipate all elements of claims1, 3, 5 and 7 as amended.

The rejection of Appellant's claims 1, 3, 5 and 7 is inconsistent with applicable statutory and regulatory requirements because Ulich '639 neither discloses nor claims all elements of Appellant's claimed invention. Referring to M.P.E.P. §2131 for exemplary authority:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The teachings of Ulich '639 do not recite or suggest each and every element of Appellant's claims 1, 3, 5 and 7, as amended. Ulich '639 describes a classical lidar that illuminates the target with a single pulse, which is brief enough to permit simple discrimination of ocean surface and submerged target [col. 3 at line 60 to col. 4 at line 3] but Ulich '639 neither considers nor suggests the concurrent **temporal and spatial discrimination** of lines and pixels as taught by Appellant. The "spatial discriminator" element (the "line scan" element) claimed in Appellant's claim 1 is described at page 6 at lines 11-13 of the specification and is neither taught nor suggested by Ulich '639. The Ulich '639 reference to "spatial resolution" [e.g., col. 4 at line 42] involves the sophisticated statistical processing [set forth in cols. 9-15] of a series of overlapping "swaths 30" and does not consider line or pixel discrimination as taught by Appellant. In fact, Ulich '639 specifically teaches against the detection concept exploited by Appellants invention, observing that "attempts at scene

reconstruction using flying spot scanner and high pulse repetition frequency sensors have suffered due to. . ." [col. 7 at lines 18-22]. Appellant claims an "imaging" lidar that, as claimed, implements a "line-scan" technique for accumulating a matrix of pixels making up a complete visual image of the underwater target. This claimed lidar uses the "line scan" technique to scan the area containing the target and to generate a "scanned" image of the target. Appellant, by discovering the combinations disclosed and claimed, has for the first time found a workable system for accomplishing what the Ulich '639 disclosure dismisses as unworkable; indeed, Ulich '639 provides an immensely complicated mathematical method for achieving results less useful than those available from Appellant's invention.

Moreover, the temporal discriminator element (the range "gating" element) of this invention claimed in Appellant's claim 5 is described at page 6 at lines 13-21 of the specification and is neither taught nor suggested by Ulich '639. Although Ulich '639 suggests pulse lengths shorter than 20 nanoseconds [col 5 at line 11], Ulich '639 neither teaches nor suggests the **range-gating** element of the invention as taught and claimed by Appellant in claim 5. This is distinct from and should not be confused with mere "gating," which is a generic term of wide application. As described in the specification at page 6, "range-gating" is also distinct from and should not be confused with the "ranging" concept used in the prior art. The brief light echo signal received during the "receive gating" period corresponds to a single "pixel" within a temporal "slice" of the target. Conversely, as clearly taught by Ulich '639 **ranging** denominates a process where a clock, which was started upon the launch of a laser pulse toward a target, is halted upon detection of light back-scattered from the target so that the round-trip transit time can be used to determine the distance to the target. The detector for such a prior-art ranging application is never blocked, which allows backscattered light to enter the detector for the entire duration of the laser pulse transit, increasing noise and preventing any "temporal discrimination" of imaging data. Being without this element of Appellant's invention, Ulich '639 is obliged to incorporate sophisticated stochastic signal processing to derive expected values of echo signal levels over time from a series of overlapping pulsed zonal illuminations so that a rough "image" can be calculated at great effort.

Ulich '639 fails to anticipate the spatial discriminator ("line scan") element of Appellant's invention as claimed in claim 1. Appellants claims 3, 5 and 7 all depend from Appellants claim 1.

Moreover, Ulich '639 fails to anticipate the temporal discriminator ("range-gating") element of Appellant's invention as claimed in claim 5. The Examiner's citation of Ulich '639 is therefore insufficient to meet the M.P.E.P. §2131 requirement for rejection of claims 1, 3, 5 and 7 under 35 U.S.C. §102. Accordingly, Appellant respectfully requests reversal of the 35 U.S.C. §102(b) rejections of claims 1, 3, 5 and 7 and remand to the Examiner for reexamination and allowance of claims 1, 3, 5 and 7.

The Examiner has not presented a valid *prima facie* case for the obviousness of any of claims 2, 4 and 6 in the Final Office Action mailed on August 10, 2001.

Reference is made to M.P.E.P. §706.02, which states:

> "After indicating that the rejection is under 35 U.S.C. §103, the examiner should set forth in the Office Action (1) the relevant teachings of the prior art relied upon, preferably with the reference to the relevant column or page number(s) and line number(s) where appropriate, (2) the difference or differences in the claim over the applied reference(s), (3) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and (4) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification."

The Examiner fails to state a proper *prima facie* case for obviousness in rejecting each of claims 2, 4 and 6 under 35 U.S.C. §103(a) as being unpatentable over Ulich '639 in view of Contarino '047, Schneiter '362 and Geiger '126, respectively. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references when combined must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Appellant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ.2d 1438 (Fed. Cir. 1991). In rejecting claims 2, 4 and 6 under 35 U.S.C. §103(a), the Examiner has not met any of the three requirements recited in *In re Vaeck*.

Suggestion or Motivation: The Examiner recites no evidence (whether implicit or explicit) of any suggestion or motivation, in the references themselves or in the prior art generally, to either

modify the references or to combine one or more of the reference teachings. Instead, the Examiner argues, with no supporting evidence, that the combination was obvious on August 07, 1997 merely because "*it is considered obvious that one in the art would have no difficulty*" making such a combination. This assertion side-steps the question of whether there is any explicit suggestion or motivation and is therefore improper according to M.P.E.P. §2143.01 and competent case law.

The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ.2d 1161 (Fed. Cir. 1999). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ.2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ.2d 1941 (Fed. Cir. 1992).

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ.2d 1430 (Fed. Cir. 1990). The Examiner offers no evidence of any suggestion in the art that it would be desirable to combine the teachings of Ulich '639 with those of Contarino '047, Schneiter '362 or Geiger '126.

A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ.2d 1300 (Bd. Pat. App. & Inter. 1993).

More recently, it has been held that the motivating suggestion for combining or modifying prior art references must be *explicit* as well. An invention cannot be found obvious unless there was "some *explicit* teaching or suggestion in the art to motivate one of even ordinary skill to combine such elements so as to create the same invention." *Winner Int'l Royalty Corp. v. Wang*, 48 USPQ.2d 1139, 1144 (D.C.D.C. 1998). The Examiner offers no evidence of any kind, implicit or explicit, suggesting that it would be desirable to combine the teachings of Ulich '639 with those of Contarino

'047, Schneiter '362 or Geiger '126. The Examiner appears to have impermissibly used "hindsight" to assess the obviousness of claims 2, 4 and 6 because the only suggestion recited for any such combination is the present application.

Reasonable Expectation of Success: The Examiner recites no evidence that the allegedly obvious combinations of elements would have encountered a reasonable expectation of success. This is improper according to M.P.E.P. §2143.02 and competent case law. In fact, the Examiner does not address this requirement of *In re Vaeck*. The Examiner appears to have impermissibly used "hindsight" to assess the reasonable expectation of success of Appellant's claims 2, 4 and 6.

All Claim Limitations: Perhaps most importantly, even when combined, the references recited by the Examiner neither teach nor suggest **all** limitations of Appellants' claimed invention. These arguments are separately set forth below.

Accordingly, in rejecting claims 2, 4 and 6 under 35 U.S.C. §103(a), the Examiner has not met any of the three requirements recited in *In re Vaeck* and therefore has not presented a proper *prima facie* case for obviousness in rejecting claims 2, 4 and 6 under 35 U.S.C. §103(a). Although Appellants are therefore not properly charged with the burden of rebutting Examiner's assertions of obviousness, the following discussion demonstrates that, even when combined, the recited references do not teach or suggest **all** limitations of Appellants' claims.

Even when combined, the teachings of Ulich '639 and Contarino '047 do not suggest that claim 2 would have been obvious to a skilled practitioner on February 28, 1997.

Claim 2 is rejected under 35 U.S.C. §103(a) for obviousness over Ulich '639 in view of Contarino '047. However, even when combined, these teachings do not include every element of Appellant's invention as claimed. The above discussion demonstrates that Ulich '639 does not anticipate all elements of the base claim 1 from which Appellant's claim 2 depends. The proposed combination of Ulich '639 and Contarino '047 is therefore missing at least one element of Appellant's claim 2. Moreover, as discussed above, Ulich '639 appears to teach against line/pixel scanning. Although Contarino '047 is unconcerned with imaging, the absence of Applicant's "range gating" technique, for example, obliges him to add radar-type modulation of his single laser pulse to permit the stochastic analysis of the ranging echo, needed to compensate for the lack of available

temporal discrimination, to improve target detection performance [col. 9]; a measure that is unnecessary in view of Appellant's teachings in the present application.

Even when combined, the teachings of Ulich '639 and Schneiter '362 do not suggest that claim 4 would have been obvious to a skilled practitioner on February 28, 1997.

Claim 4 is rejected under 35 U.S.C. §103(a) for obviousness over Ulich '639 in view of Schneiter '362. However, even when combined, these teachings do not include every element of Appellant's invention as claimed. The above discussion demonstrates that Ulich '639 does not anticipate all elements of the base claim 1 from which Appellant's claim 4 depends. The proposed combination of Ulich '639 and Schneiter '362 is therefore missing at least one element of Appellant's claim 4. Moreover, Schneiter '362 in fact neither teaches nor suggests a lidar target imaging device but instead discloses video camera system. Although Schneiter '362 mentions an **encoder** pulse rate that does not exceed 500 kHz, Appellant respectfully asserts that this encoder rate is conceptually completely unrelated to the claimed **pulse laser** repetition rate (an encoder operates to report the position of a moving shaft and a pulse laser operates to emit light pulses). Appellant's claim 4 clearly specifies that the pulse laser rate of the imaging lidar is preferably greater than 600KHz. Nothing in the Schneiter '362 reference in any way suggests the operating of an imaging lidar (or anything else) above 600 KHz; even the Schneiter '362 encoder chip operates no higher than 500 KHz. The Examiner suggests that Ulich '639 suggesting of pulse durations under 20 ns is somehow suggesting of high repetition rates. Actually, the concept of pulse duration is entirely independent of the concept of pulse repetition rate, which is more closely related to signal processing capacity than switching speeds. To accept such a conceptually unrelated figure in an obviousness analysis implies that any repetition rates from any electronic imaging art might as well suffice. Accordingly, the office action fails to propose any combination of references sufficient to arrive at the claimed subject matter.

Even when combined, the teachings of Ulich '639 and Geiger '126 do not suggest that claim 6 would have been obvious to a skilled practitioner on February 28, 1997.

Claim 6 is rejected under 35 U.S.C. §103(a) for obviousness over Ulich '639 in view of

Geiger '126. However, even when combined, these teachings do not include every element of Appellant's invention as claimed. The above discussion demonstrates that Ulich '639 does not anticipate all elements of the base claim 1 from which Appellant's claim 6 depends. The proposed combination of Ulich '639 and Geiger '126. is therefore missing at least one element of Appellant's claim 6. Also, Geiger '126 neither teaches nor suggests a periodically-poled crystal pulsed laser but instead describes a multi-crystal parametric optical oscillator. In fact, periodically-poled crystal material of the type described and claimed by Appellant in the present application was not commercially-available in 1992 when the Geiger '126 reference was filed, and could not have been considered by Geiger '126 as part of his compilation of suggested commercially-available materials.

CONCLUSION

As explained above, the Examiner's citation of Ulich '639 is insufficient to meet the M.P.E.P. §2131 requirement for rejection of claims 1, 3, 5 and 7 under 35 U.S.C. §102. Moreover, the Examiner has not presented a valid *prima facie* case for obviousness of claims 2, 4 and 6 in the Final Office Action mailed on August 10, 2001. Accordingly, the burden has not been properly shifted to Appellants to demonstrate, by means of evidence and argument, the non-obviousness of the rejected claims (M.P.E.P §706.02(j)). Nonetheless, Appellants have addressed this issue and met this burden by identifying elements of the rejected claims 2, 4 and 6 that are not suggested by the recited references even when impermissibly combined by "hindsight." Appellants stand ready to submit appropriate evidence of non-obviousness in response to a proper *prima facie* showing of obviousness.

It is submitted that, for these reasons, all claims in this application are clearly and patentably distinguished over the cited references. Accordingly, the Examiner should be reversed and directed to pass the case to issue.

The Commissioner is authorized to charge Deposit Account No. **50-0847** an amount of **$320.00** to pay the fee for filing a brief in support of an appeal per 37 C.F.R. §1.17(c). Please charge any deficit or credit any excess to Deposit Account No. **50-0847**.

Respectfully submitted,

James Albert Ward
PTO Registration No. 34,041

APPENDIX

The following claims 1-7 are involved in this appeal.

1. (Amended) An imaging lidar comprising:

a pulsed laser for generating at a pulse rate a sequence of light beam pulses each having a pulse width;

a spatial discriminator coupled to the pulsed laser for steering the light beam pulse sequence in a plurality of line scans describing an area surrounding a target, each said line scan including a plurality of said light beam pulses;

a photomultiplier tube for detecting energy from said light beam pulses scattered by said target and for generating an output signal representative of said scattered light beam pulse energy;

an image acquisition controller coupled to said pulsed laser and to said photomultiplier tube for selecting said pulse width and said pulse rate of said light beam pulses and for generating a display signal from said output signal of said photomultiplier tube;

and a display coupled to said controller for generating an image from said display signal representative of said target.

2. (Original) The imaging lidar of claim 1 wherein said laser has a wavelength corresponding to a blue-green color.

3. (Original) The imaging lidar of claim 1 wherein said pulse width is about 5 ns.

4. (Amended) The imaging lidar of claim 1 wherein said pulse rate is greater than 600 KHz.

5. (Amended) The imaging lidar of claim 1 wherein said controller includes a temporal discriminator for gating said output signal from said photomultiplier tube to select a range interval that includes said target.

7. (Added) The imaging lidar of claim 1 wherein said image includes no more than one pixel representing each of said light beam pulses.